

WHAT IS CLAIMED IS:

1. A method of sensing and indicating permanent state deviations via detection of temporary inner material oscillations in real time in parts of importance for hardware
5 design and construction, within existing production equipment, e.g. machinery, and/or monitoring of previously built-up infrastructure, **characterised in that** one or more at least approximately 20 μm thick amorphous or nanocrystalline band elements with high permeability and relatively high magnetostriction are applied to a pertinent part, the band element or elements, respectively, being at least partly
10 surrounded by a multi-turn coil, such atomic movements (oscillations) which occur in any optional such state deviation being transferred to the band element/elements, the deviation either giving rise to a clearly measurable and detectable magnetic flow change (dB/dt) in the coil in proportion to said atomic movements, or a similarly measurable and detectable inductance change in the coil/coils.
- 15 2. The method as claimed in Claim 1, **characterised in that** a carrier wave (electric voltage) of slight amplitude, for example 20 kHz, is impressed over the coil/coils, for pure deformation the current across the coil being measured, or for measurement using a plurality of bridge connected coils, the voltage difference between pairs of
20 bridge connected coils being measured, these magnitudes being substantially proportional to the mechanical stress in the bands.
3. An apparatus for sensing and indicating permanent state deviations via detection of temporary inner material oscillations in real time of importance for hardware
25 design and construction, within existing production equipment, e.g. machinery, and/or monitoring of previously built-up infrastructure, **characterised in that** it comprises one or more at least approximately 20 μm thick amorphous or nanocrystalline band elements of high permeability and relatively high magnetostriction, which element/elements, for attaining a desirable material
30 structure, are treated by magnetic heat treatment, which band element/elements being surrounded by multi-turn coils, such atomic movements (oscillations) as occur in any

optional such state deviation, in that they merge in the band element/elements, either giving rise to a clearly measurable and detectable magnetic flow change (dB/dt) in the coil in proportion to the atomic movements, or a similarly measurable and detectable inductance change in the coil/coils.

5

4. The apparatus as claimed in Claim 3, **characterised in that** the band element/elements with associated coil/coils are enclosed in an elastically deformable epoxy polymer.
- 10 5. The apparatus as claimed in Claim 3 or 4, **characterised in that** the band element/elements and the coil/coils are glued to the object whose permanent state deviations are to be indicated.
- 15 6. The apparatus as claimed in any of Claims 3 to 5, **characterised in that** the sensitivity thereof is different depending upon the orientation of the detection direction in relation to the rolling direction of the band element/elements, as a consequence of directional dependent qualities in the material.
- 20 7. The apparatus as claimed in any of Claims 3 to 6, **characterised in that** the band elements with associated coils are bridge- and amplifier connected in order to increase sensitivity and detectability, respectively.
- 25 8. The apparatus as claimed in any of Claims 3 to 7, **characterised in that** it is realised as a glass breakage indicator, accelerometer, transducer for acoustic emission or load indicator.